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Oral Health and Interprofessional Education Experiences in Family Medicine and Pediatric Residency

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Abstract

INTRODUCTION Prevention of dental diseases in children requires interprofessional education (IPE) and care coordination between oral health professionals and primary care providers; however, the extent of preparation of medical residents and its impact on their provision of preventive oral health services in clinical practice requires further investigation.

METHODS A two-stage cluster sample of 470 US family medicine and 205 pediatric residency programs was used. A random sample of 30% ($N=140$) of family medicine and 29% ($N=60$) of pediatric residency programs were randomly selected. Of these, 42 programs (21%) invited residents to participate. Residents ($N=95$, 28%) completed an online questionnaire regarding oral health training in residency. Statistical analysis included frequencies and Spearman's rank correlations.

RESULTS Eighty-three percent of family medicine and pediatric residents combined reported receiving oral health education. Clinical experiences involving oral healthcare were frequently reported (77%, $n=75$); however, IPE with an oral health professional was limited. Both groups indicated they provided anticipatory guidance regarding regular dental visits and toothbrushing "very often" and avoiding bottles at bedtime "often." Residents reported performing dental caries assessments "often" and applying fluoride varnish "occasionally." For family medicine residents, moderate correlations ($p \leq 0.01$) were found between hours of oral health education and providing anticipatory guidance. For pediatric residents, a moderate correlation ($p < 0.01$) was found between hours of oral health education and assessing teeth for demineralization.

CONCLUSION Increased effort is needed to meet national recommendations for educating family medicine and pediatric residents regarding oral healthcare for children, including increased IPE involving oral health professionals.

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Implications for Interprofessional Practice

This study:

- Serves as a current assessment of the level of interprofessional education within the oral health training of family physicians and pediatricians.
- Emphasizes the importance of primary care providers and oral health professionals working together in an interprofessional approach for the overall health of the nation's children.
- Emphasizes the need for family medicine and pediatric residency programs to continue to increase implementation of national recommendations and interprofessional education into clinical practice.
- Suggests a need for increased collaboration among dental hygienists, dentists, and dental professional students within the interprofessional education and oral health training of primary care providers and provides an educational model designed to foster that goal.
- Supports practice initiatives expanding the application of oral health care interventions by all primary care providers.

Introduction

Oral health is a vital component of overall health and, therefore, the responsibility of pediatricians. Accordingly, the American Academy of Pediatrics (AAP) recommends pediatricians play an integral role in children's oral health by providing preventive oral health services including anticipatory guidance, oral health screenings and assessments, and fluoride varnish applications during well-child visits (AAP, 2014). This recommendation applies not only to pediatricians but to other primary care providers (PCP), such as family physicians, nurse practitioners, and physician assistants (PA) (National Interprofessional Initiative on Oral Health [NIIOH], 2011). In 2014, the U.S. Preventive Services Task Force (USPSTF) recommended PCP prescribe fluoride supplementation to children beginning at 6 months of age if they reside in areas with suboptimal fluoride concentration in the drinking water and provide fluoride varnish applications to all children beginning at eruption of the first tooth (USPSTF, 2014). In support of these recommendations, medical insurers are required to reimburse providers under the Affordable Care Act (ACA) for services assigned

a grade A or B by the USPSTF. This reimbursement includes fluoride varnish applications for children ages 0-5 years (Kaiser Family Foundation [KFF], 2014).

These national children's oral health initiatives coincide with the recent emphasis on integrating interprofessional education (IPE) opportunities across the healthcare professions to improve the health of the nation and overall quality of care (Institute of Medicine [IOM], 2011). IPE opportunities involving oral health experts such as dental hygienists, dentists, and/or dental professional students are integral to effectively train PCP to deliver preventive oral health services to children. Little is known about IPE opportunities involving dental professionals in family medicine and pediatric residencies.

Patients of all ages experience needless dental disease-related pain and expense, in part, because their PCP has not been trained to provide preventive oral health services (NIIOH, 2009). The general health status of children and adolescents can be improved by prevention and early intervention of oral diseases, including dental caries, before they develop into more complicated

infections and systemic health complications (KFF, 2014). Left untreated, pediatric dental disease can result in malnutrition, microbial infections, emergency surgery, and death (National Oral Health Foundation, 2012). When considering the fact that only 50% of all children on Medicaid visited a dentist in 2011, the need for delivery of children's preventive oral health services by family medicine residents, pediatric residents, and practicing physicians, as well as other PCP, becomes evident (Pew Charitable Trust, 2014). IPE for these providers on the front line of children's healthcare provides an opportunity to expand access to preventive care.

Literature Review

Studies suggest minimal hours dedicated to oral health education in family medicine and pediatric residency programs, despite the AAP's policies and an accreditation standard requiring family medicine residency programs to provide oral health education (Accreditation Council for Graduate Medical Education [ACGME], 2014). Caspary, Krol, Boulter, Keels, and Romano-Clarke (2008) reported 35% of pediatric residents indicated they had received no oral health education and, of those who did, 73% had <3 hours of training and 21% clinically observed a dentist. These findings were supported by findings of Lewis et al. (2009) which indicated less than half of post-residency pediatricians reported they received any oral health education while attending medical school, residency, or Continuing Medical Education (CME) courses. These pediatricians believed they should play a role in children's oral health; however, a low percentage provided preventive oral health services such as identifying plaque on children's teeth (25%) and applying fluoride varnish (3.8%). Results of a study by Herndon, Tomar, Lossius, and Catalanotto (2010) differed, indicating 79% of post-residency pediatricians practicing in Florida reported receiving oral health training during medical school or residency; however, a multivariate analysis determined, although oral health training was related to confidence levels, it did not affect physicians' delivery of oral health services.

Some studies of family medicine programs surveyed program directors rather than residents. Douglass et al. (2009) reported family medicine residency program directors indicated their curricula included one to two hours of oral health education. In 2012, Silk, King, Bennett, Chessman, and Savageau reported 45%

of family medicine residency directors included three or more hours dedicated to oral health training, with 32% reporting IPE utilizing an oral health professional, and concluded more hours were being allocated to oral health training than reported in earlier studies.

Limited evidence suggests that IPE experiences can impact the delivery of preventive oral health services in the daily practices of family medicine and pediatric residents. A pilot study by Gonsalves, Skelton, Smith, Hardison, and Ferretti (2004) assessed the impact of an oral health training program developed for family medicine residents by medical and oral health experts. The training included IPE clinical experiences for the residents to provide preventive oral health services for children under 5 years of age. Post-training chart audits indicated 65.6% of these residents included oral health screenings as a part of the well-child preventive care record. Wawrzyniak, Boulter, Giopopoulos, and Zivitksi (2006) conducted a study to determine the effects of oral health education on family medicine residents providing oral health screenings and applying fluoride varnish during well-child visits. Oral health professionals and a pediatrician developed the training, and a dental hygienist provided hands-on demonstrations of oral health screenings and fluoride varnish applications. Two years later, results indicated an increase in the percentage of residents providing oral health services during well-child visits. Talib, Onikul, Filardi, Simon, and Sharma (2012) conducted a randomized clinical trial (RCT) to compare results of oral health education programs involving hands-on training and web-based training to pediatric residents. The hands-on component included IPE utilizing a pediatric dentist to demonstrate oral exams, apply fluoride varnish, and deliver anticipatory guidance. Findings indicated the residents' knowledge of pediatric oral health had increased via web-based training alone. Further, the addition of hands-on training by an oral health professional was found to increase the overall skills of oral examination. The authors noted that further study is needed.

Although some family medicine, pediatric, and other healthcare professional programs appear to be utilizing the expertise of oral health professionals to foster oral health knowledge and skills, questions remain regarding whether frequency and type of instruction is currently increasing in the US to meet national standards. The potential relationship between oral

health training including IPE experiences with an oral health professional and the provision of preventive oral health services to children needs further examination. The purpose of this study was to determine family medicine and pediatric residents' self-reported experiences regarding: 1) oral health education in residency, 2) type of instruction including IPE, and 3) whether a relationship exists between the delivery of preventive oral health services during well-child visits and the total number of hours of oral health education.

Methods

An online survey was adapted from the 2006 AAP Annual Survey of Graduating Residents (Caspary et al., 2008) and the survey developed by Lewis et al. (2009). The content was validated by five experts in IPE and/or the development of oral health education for PCP. Recommendations from the experts were incorporated in the final survey instrument. In addition, test-retest reliability was established by family medicine residents ($n=4$) from the university affiliated with the study. Results indicated reliability ($r=0.93$) between the two surveys completed one week apart. This adapted, validated instrument was used to assess the family medicine and pediatric residents' self-reported total number of oral health education hours received during residency, type of instruction received, and frequency of delivering preventive oral health services during well-child visits.

A simple two-stage cluster sample of 470 family medicine and 205 pediatric residency programs was used. In the first stage, 30% of U.S. family medicine programs ($N=140$) and 29% of U.S. pediatric residency programs ($N=60$) were randomly selected for inclusion using an online research randomizer. After receiving a Certificate of Exemption from the sponsoring university's Human Subjects Committee, all third-year residents enrolled in the randomly selected programs were invited to participate in the study, pending assistance by the program director or residency coordinator. Program contact information was obtained from the Accreditation Data System list managed by the ACGME (2013); each program was assigned a code for confidentiality.

Individual e-mails were sent to all program contacts to garner support for the study and personalize

the invitation to facilitate data collection (Dillman, Smyth, & Christian, 2009). The e-mail communication provided a description and study purpose, encouraging the program's contact person to forward the study consent form and online survey link to third-year family medicine or pediatric residents. A reply regarding willingness to forward the study materials to residents and the number of third-year residents enrolled was requested. The total number of enrolled third-year residents was used to determine an accurate response rate for the second stage cluster sample of residents. Several attempts were made to follow up with non-respondents via email, telephone, and messages.

The online survey link was e-mailed to program contacts willing to invite third-year residents' participation. An online survey platform, Qualtrics, was used to collect data from third-year family medicine and pediatric residents. Residents accessed the online survey instrument, instructions, and informed consent through a forwarded e-mail from their program contact. A drawing for a \$300.00 Amazon gift card was offered to the program contacts and the third-year residents as an incentive to participate in the study. After the residents elected to participate, and completed the online informed consent form and online survey, each was asked to voluntarily provide the name of the residency program where they were enrolled. They were assured this information would be coded and kept confidential. The final participant response rate was determined utilizing the number of enrolled third-year residents provided by each program contact and the number of online survey responses received.

Statistical analysis included descriptive statistics for participant demographics. Percentages and frequencies were used to summarize residents' responses in relation to the amount and type of learning activities received in their oral health education. Spearman's rank correlation coefficient was computed to identify relationships between frequency of the delivery of oral health services and the total number of hours spent in oral health education.

Results

Response rates for the residency programs that facilitated delivery of the online survey to their third-year residents were 21% ($N=42$ of 201) for all programs

combined, 14% ($n=20$ of 141) for family medicine residency and 37% ($n=22$ of 60) for pediatric programs. Response rates for the third-year resident participants were 28% ($N=95$ of 336) for all residency programs combined, 36% ($n=38$ of 105) for family medicine, and 25% ($n=57$ of 231) for pediatric. Two responses were not included because the participants completed only the demographics portion of the survey.

Table 1 presents demographic data for the sample of third-year residents. The average age of respondents was 30.5 years, ranging from 28 to 40 years. The majority of the participants reported their race as White, non-Hispanic (75.8%, $n=72$). Survey question options and responses regarding race are listed in Table 1. Gender was not included in the demographic data due to a malfunction in the online survey program for that item.

Eighty-three percent of all third-year family medicine ($n=38$) and pediatric ($n=57$) residents reported

receiving some type of oral health education in the residency program. Percentage of participants reporting no oral health education during residency were 17% ($n=16$) for all respondents, 32% ($n=12$) for family medicine residents, and 7% ($n=4$) for pediatric residents. Although 45% ($n=17$) of the family medicine residents ($n=38$) and 42% ($n=24$) of pediatric residents ($n=57$) reported receiving 1 to 3 hours of oral health instruction, the median number of hours reported was 1 to 3 hours for family medicine, 4 to 6 hours for pediatrics, and 1 to 3 hours for all third-year residents combined (Table 2 (following page)).

Tables 3 and 4 (following page) report frequency of the type of oral health instruction received during residency including classroom, community, and clinically based activities. The most frequent response was 1 to 3 hours of classroom instruction for family medicine ($n=15$ of 24, 63%) and pediatric ($n=35$ of 48, 73%) respondents. Clinical activities also were reported frequently. One to

Table 1. Respondents' Age and Race Characteristics

Characteristics of Residents	Family Medicine	Pediatric	Combined
	<i>n</i>	<i>n</i>	<i>N</i>
Average Age ^a	31.5 (2.9)	29.8 (1.8)	30.5 (2.4)
<i>Race</i>			
White	28 (74)	44 (77)	72 (76)
Black	0	3 (5)	3 (3)
Asian Indian	0	2 (4)	2 (2)
Chinese	2 (5)	0	2 (2)
Filipino	1 (3)	1 (2)	2 (2)
Guamanian	1 (3)	0	1 (1)
Other Asians	2 (5)	2 (4)	4 (4)
Other	4 (10)	4 (7)	8 (8)
Totals	$n=38$	$n=57$	$N=95$

^aStandard deviation in parentheses

Table 2. Respondents Reporting Total Hours of Oral Health Training and Education during Residency*

Hours	Family Medicine <i>n</i> (%)	Pediatric <i>n</i> (%)	All <i>N</i> (%)
No Training	12 (32%)	4 (7%)	16 (17%)
1-3 Hours	17 (45%)	24 (42%)	41 (43%)
4-6 Hours	8 (21%)	22 (38%)	30 (32%)
7-9 Hours	0	5 (9%)	5 (5%)
10-12 Hours	1 (3%)	1 (2%)	1 (1%)
13+ Hours	0	1 (2%)	1 (1%)
<i>n</i>	38	57	95
Median	1-3 Hours	4-6 Hours	1-3 Hours

*Percentages rounded to the nearest whole number; column totals range from 99% to 101%

Table 3. Respondents Reporting Total Classroom, Community, and Oral Health Clinical Activities Hours of Instruction for Family Medicine Programs

Location	0 Hours	1-3 Hours	4-6 Hours	7-9 Hours	10-12 Hours	<i>n</i>
Classroom	7 (29%)	15 (63%)	1 (4%)	1 (4%)	0	24
Community Service Experiences	21 (88%)	3 (13%)	0	0	0	24
Clinical Activities	10 (42%)	11 (46%)	3 (13%)	0	0	24

Note: Totals equal > 100 percent as respondents selected all responses that applied.

Table 4. Respondents Reporting Total Classroom, Community Oral Health Experiences, and Clinical Activities Hours of Instruction for Pediatric Residency Programs*

Location	0 Hours	1-3 Hours	4-6 Hours	7-9 Hours	10-12 Hours	<i>n</i>
Classroom	9 (19%)	35 (73%)	4 (8%)	0	0	48
Community Service Experiences	27 (60%)	17 (38%)	1 (2%)	0	0	45
Clinical Activities	13 (26%)	29 (58%)	5 (10%)	1 (2%)	2 (4%)	50

Note: Totals equal > 100 percent as respondents selected all responses that applied

three hours were reported by 46% of family medicine ($n=11$) and 58% of pediatric ($n=29$) residents. Both groups included additional respondents reporting more than three hours, indicating a majority of residents in both groups underwent some clinical experience during residency.

Tables 5 and 6 display data summarizing responses of those residents who responded to the items concerning IPE experiences involving an oral health professional or student: 66% of family medicine residents ($n=25$) and 84% of pediatric residents ($n=48$). A majority of both family medicine and pediatric residents, respectively, reported having had no exposure to IPE in the classroom (60%, $n=15$ and 54%, $n=26$), community, (88%, $n=22$ and 85%, $n=41$), or clinical setting (76%, $n=19$ and 67%, $n=32$) during their oral health education. Respondents

who reported having any type of IPE during their oral health education with an oral health professional most commonly indicated that a dentist was the oral health professional involved.

The median number of family medicine ($n=36$) and pediatric residents' ($n=54$) responses regarding the frequency of preventive oral health services during well-child visits is presented in Table 7 (following page). Both family medicine and pediatric residents indicated preventive oral health services were provided "very often" in response to *educating patients and parents/caregivers on the importance of regular dental visits and toothbrushing*. Pediatric residents reported "often" *assessing children's teeth for dental caries and educating parents/caregivers regarding oral health effects of a child sleeping with a bottle with something other than water* and

Table 5. Respondents Reporting Type of IPE Training Provided by an Oral Health Professional in Family Medicine Residency ($N=38$)*

Location	Dentist	Dental Hygienist	Dental Professional Student	None	<i>n</i>
Classroom	8 (32%)	1 (4%)	3 (12%)	15 (60%)	25
Community Experiences	2 (8%)	0	1 (4%)	22 (88%)	25
Clinical Activities	4 (16%)	1 (4%)	1 (4%)	19 (76%)	25

*Respondents selected all that applied; percentages are based on 25 respondents for each item. A total of 13 family medicine resident respondents did not answer the questions.

Table 6. Respondents Reporting Type of IPE Training Provided by an Oral Health Professional in Pediatric Residency ($N=57$)*

Location	Dentist	Dental Hygienist	Dental Professional Student	None	<i>n</i>
Classroom	17 (35%)	1 (2%)	4 (8%)	26 (54%)	48
Community Experiences	3 (6%)	0	4 (8%)	41 (85%)	48
Clinical Activities	9 (19%)	1 (2%)	10 (20%)	32 (67%)	52

*Respondents selected all that applied; percentages are based on 48 respondents for each item. A total of 9 pediatric resident respondents did not answer the questions.

Table 7. Median Response to Frequency of Oral Health Services Delivered to Children (0-5 years old) at Well-Child Care Visits in Clinical Practice

Oral Health Service	Family Medicine Residents (n=36)	Pediatric Residents (n=54)	All Residents (N=90)
Assess Children's Teeth for Dental Caries (Tooth Decay)	Often (4)	Often (4)	Often (4)
Assess Children's Teeth for Enamel Demineralization	Occasionally (3)	Occasionally (3)	Occasionally (3)
Assess Children's Teeth for Plaque	Occasionally (3)	Rarely (2)	Rarely (2)
Assess Parents'/Caregivers' Oral Health History	Rarely (2)	Rarely (2)	Rarely (2)
Apply Fluoride Varnish to Children's Teeth	Rarely (2)	Occasionally (3)	Occasionally (3)
Educate Patients and Parents/Caregivers on Importance of Regular Visits to the Dentist	Very Often (5)	Very Often (5)	Very Often (5)
Educate Patients and Parents/Caregivers on Importance of Regular Tooth Brushing	Very Often (5)	Very Often (5)	Very Often (5)
Educate Parents/Caregivers on Oral Health Effects of a Child Sleeping with a Bottle with Something Other Than Water	Often (4)	Often (4)	Often (4)
Educate Patients and Parents/Caregivers on the Oral Health Effects of Juice, Sweetened Beverages, or Carbonated Beverages	Often (4)	Often (4)	Often (4)

Likert Scale used for frequency responses: 1=Never, 2=Rarely, 3=Occasionally, 4=Often, 5=Very Often

giving a child juice, sweetened, or carbonated beverages. Both family medicine and pediatric residents reported "rarely" assessing parents'/caregivers' oral health history. Applying fluoride varnish to children's teeth was reported as "rarely" provided by family medicine residents and "occasionally" provided by pediatric residents.

Spearman's Rank Correlation was used to determine the magnitude and direction of the relationship between reported preventive oral health services provided by participants during well-child visits and the total hours of oral health education reported. Correlation data and p values are presented in Table 8 (following page).

Although several correlations had statistical significance ($p < 0.05$), the strength of some of the associations were weak. For family medicine residents, total hours of oral health education were moderately associated with providing education to patients and parents/caregivers on the oral health effects of a child sleeping with a bottle with something other than water ($r=.566$, $p < 0.001$), importance of regular visits to the dentist ($r=.539$, $p < 0.01$) and regular toothbrushing ($r=.568$, $p < 0.001$). For pediatric residents, assessing children's teeth for enamel demineralization ($r=.435$, $p < 0.01$) during well-child visits was moderately correlated with the total number of hours of oral health education.

Table 8. Spearman's Rank Order Correlations for Relationship between Frequency of Oral Health Services at Well-Child Care Visits by Total Hours of Oral Health Education/Training

Oral Health Service	Family Medicine Residents (n=36)	Pediatric Residents (n=54)	All Residents (N=90)
Assess Children's Teeth for Dental Caries (Tooth Decay)	0.378*	0.294*	0.345**
Assess Children's Teeth for Enamel Demineralization	0.273	0.435**	0.369***
Assess Children's Teeth for Plaque	0.115	0.399**	0.263**
Assess Parents' Caregivers' Oral Health History	-0.028	0.045	0.015
Apply Fluoride Varnish to Children's Teeth	0.227	0.098	0.189
Educate Patients and Parents/Caregivers on the Importance of Regular Visits to the Dentist	0.539**	-0.075	0.231*
Educate Patients and Parents/Caregivers on the Importance of Regular Tooth Brushing	0.568***	0.028	0.336**
Educate Parents/Caregivers on Oral Health Effects of Child Sleeping with a Bottle with Something Other Than Water	0.566***	0.142	0.348**
Educate Patients and Parents/Caregivers on the Oral Health Effects of Juice, Sweetened Beverages, or Carbonated Beverages	0.349*	0.063	0.184

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ ***

Discussion

Family physicians and pediatricians play an important role in children's oral health, especially for those at high risk for dental disease. Notwithstanding an accreditation standard requiring family medicine residency programs provide oral health education and numerous available online CME-approved courses, 32% of family medicine respondents reported receiving no oral health education during residency. The median response regarding total number of hours by family medicine residents was one to three hours, possibly slightly more than findings by Douglass et al. (2009)

citing one to two hours and supporting findings of Silk et al. (2012) who concluded oral health instruction had increased in family medicine residencies. Silk indicated, however, that 45% of family practice residency program directors reported three or more hours, a total higher than reported by these residents.

No similar accreditation standard for pediatric residency programs exists; however, the AAP has emphasized the pediatrician's role in children's oral health and recommended pediatricians provide oral health services to children and offered related online CME courses. These and other national initiatives have apparently positively

impacted oral health curriculum content in pediatric residencies, as only 7% of pediatric residents indicated receiving no education, in contrast to Caspary's et al. (2008) findings of 21%. Pediatric residents responding to this study reported receiving a total of four to six hours of oral health instruction, whereas family medicine residents reported one to three hours. Although pediatric residents reported receiving more hours than family medicine residents, all of these residents continue receiving limited hours of oral health education.

Another factor that could affect family physicians' or pediatricians' provision of preventive oral health services to children is the type of educational experiences included in the curriculum. Clinical activities incorporating the delivery of preventive oral health services were reported by over three out of four of these family medicine and pediatric residents, with the most frequent estimate of total clinical experiences being one to three hours. Apparently, most family medicine and pediatric residents are benefiting from combined oral health-related didactic and clinical activities.

Nonetheless, respondents to this survey reported receiving most of their oral health education through classroom instruction. This type of instruction may have included oral health education delivered through online programs, although this study did not differentiate online instruction from classroom instruction when assessing the method of delivery. Some residents could have interpreted online programs to be a subcategory of classroom instruction. Others may not have considered online instruction.

Some methods of education are more effective than others in increasing oral health knowledge of healthcare providers and increasing the preventive oral health services provided by health professional students. One approach that has been reported as positive is an IPE component involving and oral health professional in the training (Anderson, Smith, & Brown, 2013; Gonsalves et al., 2004; Skelton et al., 2002; Talib et al., 2012; Wawrzyniak et al., 2006). A large majority of respondents in this study reported encountering no IPE during their oral health training; however, findings indicated some programs are including IPE with oral health professionals, primarily dentists. Dental hygienists are primary care oral health professionals

licensed to provide preventive and therapeutic services that support overall health (ADHA, 2014a). Thus, they have expertise regarding oral health assessment, preventive services and anticipatory guidance. There are 335 entry-level dental hygiene programs (ADHA, 2014b) and 60 dental schools in the US (ADEA, 2012); therefore, availability of personnel for IPE is expanded with the inclusion of dental hygienists. Medical residency educators should consider collaborative experiences with dental hygiene educators as a method of increasing IPE in the oral health component of their curriculum. Studies involving IPE and oral health curriculum development involving physicians and oral health professionals have indicated that educational experiences increase frequency of delivery of oral health services provided by participating practitioners. Family physicians and pediatricians are in an opportunistic position to deliver oral health screenings and assessments, anticipatory guidance, and fluoride varnish applications to children during well-child visits given appropriate education and training. Residents in this study reported providing education or anticipatory guidance to parents/caregivers more frequently than actually assessing a child's teeth for plaque or enamel demineralization, a finding supporting previous findings by Lewis et al. (2009). Both groups did, however, report assessing children's teeth for dental caries "often." Family medicine residents reported only "rarely" applying fluoride varnish to children during well-child care visits, and pediatric residents reported only "occasionally" providing the service. This finding is interesting since this service is eligible for Medicaid reimbursement in several states (AAP, 2014). All children enrolled in Medicaid and Children's Health Insurance Program (CHIP) now have coverage for oral health services, and the ACA requires medical insurance reimbursement for the application of fluoride varnish (Centers for Medicaid and CHIP Services, 2015). These oral health promotion efforts might be the impetus for increasing access to preventive oral healthcare for children in the U.S.

Relationships were evident in this study between certain preventive oral health services provided at well-child visits by family medicine and pediatric residents and the total hours of oral health education received. Assessing children's teeth for enamel demineralization was moderately correlated with pediatric residents providing number of hours of oral health education

received. However, the moderate correlations between preventive oral health services provided and total hours of related instruction were limited to providing anticipatory guidance for family medicine residents. This difference could be due to the amount of attention the AAP has dedicated to pediatricians delivering these services, and the resources they have provided (AAP, 2014), rather than the number of hours of oral health education included in the curriculum. Herndon et al. (2010) found no correlation between total hours of instruction and delivery of preventive oral health services, and this study found few. Perhaps the more important factor is the type of education and experiences related to oral health being included in the residency curriculum. This issue requires further investigation. The low number of responses to the IPE items in this survey precluded statistical analysis of these associations.

One of the limitations of this study was a low response rate of residency programs and third-year residents participating in the study, which is common among studies involving healthcare providers as participants (VanGeest, Johnson, & Welch, 2007). Although response rates were low, this study utilized a random sample, was conducted on a national level, and had a small, but representative sample of third-year residents. According to Cook, Health and Thompson (2000), the representativeness of survey responses is more important than response rate. The monetary incentives, short survey and involvement of a medical peer used in this study have all been shown to increase physician response rates (VanGeest, Johnson, & Welch, 2007).

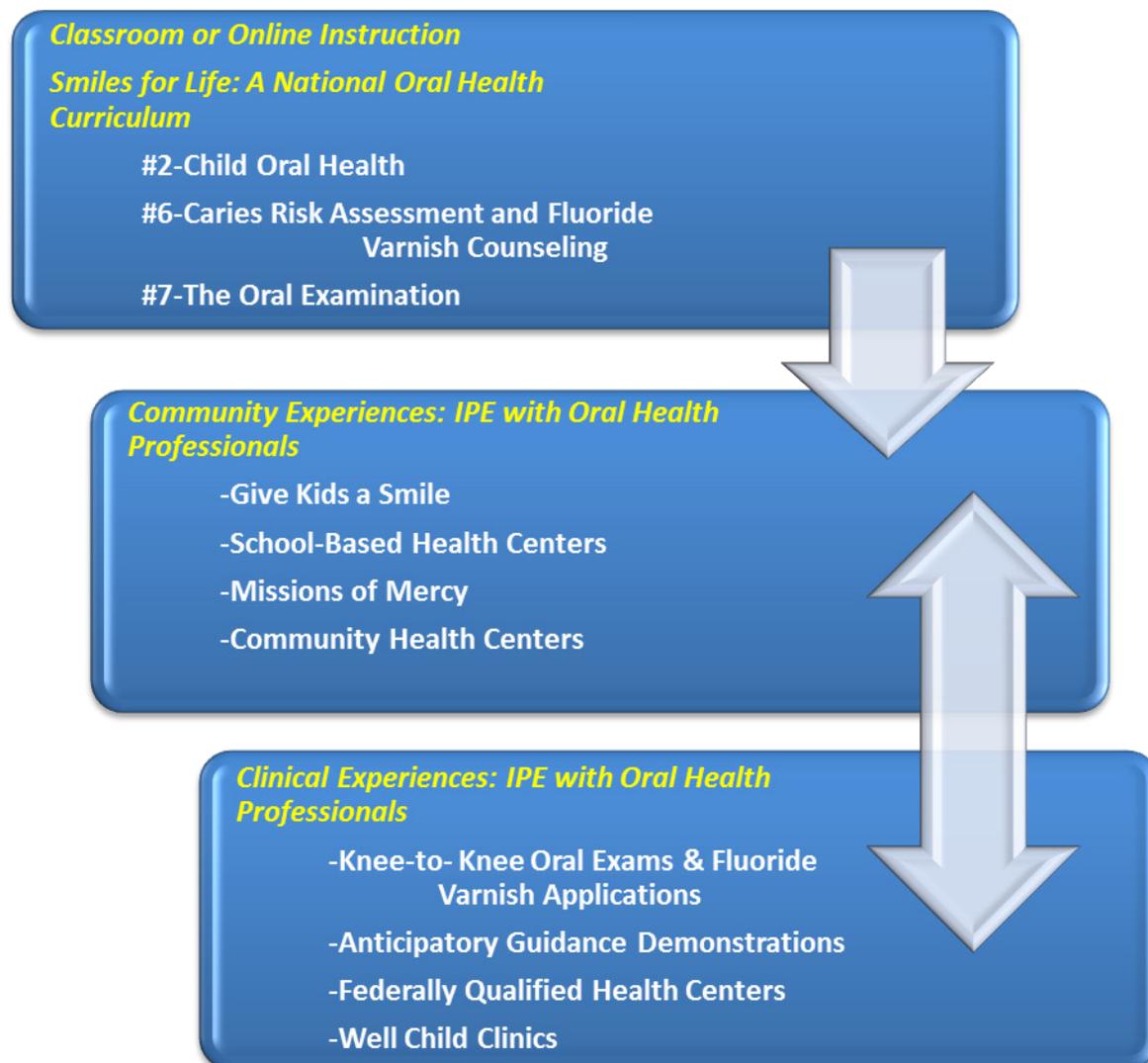
Other factors that limited the number of responses were the high number of surveys conducted with medical residency programs and the fact the timing of the study being near the time of graduation for third-year family medicine and pediatric residents. Several family medicine residency programs refused to invite their third-year residents due to frequent survey requests, and several program administrators failed to return voicemails. When comparing the response rates of online and mail surveys, online surveys traditionally have a lower response rate (Manfreda, Bosnjak, Berzelak, Haas & Vehovar, 2008). Lastly, the participants' lack of interest in oral health education, otherwise known as topic saliency, might have influenced response rates. Topic saliency has shown to play a role in studies with low response rates (Adua & Sharp, 2010).

Conclusion

Findings from this study provide valuable insight into oral health curricular content in US family medicine and pediatric residency programs. There is a clear need for more effort in this area to meet national recommendations regarding the need for provision oral health assessments and preventive services by PCP. This study provides insight into the role oral health professionals may be playing in IPE. Results indicate oral health education, in addition to IPE, may have slightly increased in pediatric residency programs across the nation over the past five to ten years, possibly influenced by the addition of clinical experiences, based on a comparison of findings with previous reports in the literature. Further research is needed on the role IPE plays in these providers delivering preventive oral health services to children during well-child visits and on the effects the USPSTF recommendation and increased insurance reimbursement have on the provision of these services. Innovative methods for delivery of education in this area are needed with emphasis on the alignment of learning objectives with national recommendations.

A Proposed Model for Oral Health-Related IPE for Primary Care Providers

To address the documented need to enhance preparation of medical residents in oral disease prevention and the potential impact of enhanced preparation on the care of children, an educational model to attain these goals is demonstrated in Figure 1 (following page). Educational programs providing training for PCP can incorporate oral health education into their existing curricula by utilizing *Smiles for Life: A National Oral Health Curriculum* (SFL) as an online educational unit assigned as independent study to save classroom hours in already overcrowded curriculums. After completing SFL, residents can learn how to provide oral health screenings and fluoride varnish applications through IPE demonstrations and experiences involving oral health professionals within existing or new clinical and community settings. Implementing this curricular model would allow medical residency programs to support evidence-based best practices, national recommendations, and help prevent dental disease in children.

Figure 1. *Interprofessional Oral Health Education Model*

Conflicts of Interest

The authors have no conflicts of interest.

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